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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/882,403	06/15/2001	Mamoru Suzuki	7217/64724	8321

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COOPER & DUNHAM LLP
1185 Avenue of the Americas
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EXAMINER

TIBBITS, PIA FLORENCE

ART UNIT	PAPER NUMBER
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2838

DATE MAILED: 04/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 09/882,403	Applicant(s) SUZUKI ET AL.	
	Examiner Pia F. Tibbits	Art Unit 2838	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4 and 6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4 and 6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input checked="" type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office action is in answer to the amendment filed 2/22/2005. Claims 4 and 6 were amended and are pending.

Drawings

1. The drawings are finally objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the means for determining must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claim 4 is objected to because of the following informalities: "said means for determining" lacks antecedence. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Friel et al.** [hereinafter Friel][6025695].

Friel discloses in figures 1-62 a battery charging/discharging apparatus for determining an actual remaining capacity of a battery 28, comprising: detecting means for detecting a cell voltage/resistor R_2 in fig.2; a microcomputer/hybrid IC 32 for determining a remaining capacity value CAP_{rem} based on the cell voltage detected by said detecting means/resistor R_2 in fig.2; a memory for storing the determined capacity value/RAM; the microcomputer/hybrid IC 32 including A/D converter of hybrid IC32 compares the remaining capacity value read from the memory/RAM with a current remaining capacity value determined by the means for determining/hybrid IC 32; and updating means for periodically updating/at each EOC and EOD the currently-stored-remaining-capacity-value based on a result of said comparing means/A/D converter of hybrid IC 32 [see also fig.3; column 3, line 20-25, 36, and 43; column 5, lines 61-62;].

The patent describes a smart battery utilizing a hybrid integrated chip (IC) containing an embedded microprocessor and a novel analog to digital connector which receives analog signals from the battery and converts them to digital signals representative of battery voltage, current and temperature. The smart battery microprocessor then calculates actual charge parameters over time from these digital signals according to a predetermined algorithm in which CAP_{rem} is the remaining capacity of the battery, **which is continuously assigned a new value to reflect adjustments** for effective charge, discharge, and self-discharge (column 14, lines 55-65). Fig.3 describes the voltage levels representing battery temperature, current and voltage being applied to a switching network 55. This switching network then applies these voltage levels, one at a time and in a defined sequence, to an A/D converter, and this converter converts these analog voltage levels to raw digital data values representing battery

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temperature, current and voltage. These raw data values are transmitted to register 61 for temporary storage and from which the data values are available to the microprocessor. The specific lengths of time that the converter processes the applied analog signals are under the control of clock signals transmitted to the converter from an internal clock 48.

With regard to the patent using battery voltage, current and temperature inputs for establishing a remaining capacity value CAP_{rem} ; eliminating battery current and temperature inputs, cited in the Friel reference, applicant neither extends the life of the batteries being charged, nor makes it easier to determine the remaining battery capacity with high accuracy, which is the object of his invention, as cited in the disclosure. Therefore it would be obvious to one skilled in the art at the time the invention was made that the elimination of an element and its function in a combination is an obvious expedient if the remaining elements perform the same functions as before. See *In Re Karlson*, 136 USPQ 184 (CCPA 1963), *In Re Wilson*, 153 USPQ 740 (CCPA 1967), and *Ex Parte Rainu*, 168 USPQ 375 (PTO Bd. of App. 1969).

With regard to the limitation of periodically updating the remaining capacity value stored in the memory based on result of said comparing means: US 5606242 is incorporated by reference in the Friel patent, and describes including a hybrid integrated circuit (IC) having a microprocessor for receiving analog signals and converting them to digital signals representative, *inter alia*, of battery voltage, and calculating actual charge parameters **over time** from the digital signals, the calculations including one calculation for the remaining capacity CAP_{rem} of the battery according to an algorithm, and as a function of CAP_{FC} ; a reset logic, that self corrects the value of CAP_{FC} with a capacity calculation at each full charge (EOC) and each end of full discharge (EOD). The reset logic will also reset CAP_{FC} as a function of which EOD signal was acted on. Thus a new CAP_{FC} value for the smart battery's **actual capacity** is learned after each full discharge cycle, as a function of the last fully integrated battery discharge cycle. The smart battery 10 of the patent is thus able to self correct CAP_{FC} within one full cycle to readjust its capacity at each EOC and EOD, and effectively relearn full battery capacity within a single cycle, even if all prior battery history has been extinguished by virtue of a catastrophic memory failure. The smart

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battery of the patent is therefore able to accurately predict actual capacity, and typically is able to correctly predict the remaining run time to empty within a few minutes for the battery [see also the abstract, column 1, lines 27-30, 41-50, 60-64; column 2, lines 43-54, 64-67; column 5, line 12-15; column 6, lines 7-40, 48-62; column 14, lines 28-55; column 15, lines 3-4, 14-40; column 19, lines 4-19, 40-63; column 25, lines 38-39, etc.]. Therefore, it is an inherent function of the smart battery, disclosed by Friel, to continuously monitor the battery remaining capacity value, compare it to a battery remaining capacity value at the last fully integrated battery discharge cycle, and reset/store in a logic/memory an actual updated battery remaining capacity value, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent**.

With regard to the limitation of having the updating means replace the remaining capacity value stored in the memory with the current remaining capacity value determined by said means for determining in case that the remaining capacity value stored in the memory is greater than the current remaining capacity value determined by said means for determining: Friel discloses that if the pack voltage is greater than the preset threshold, then the Wake-Up Comparator "awakens" the rest of the ASIC, and the smart battery microprocessor then calculates **actual** charge parameters over time from the digital signals according to a predetermined algorithm in which CAP_{rem} is the remaining capacity of the battery which is continuously assigned a new value to reflect adjustments for effective charge, discharge, and self discharge. The reset logic will reset CAP_{FC} as a function of the EOD signal. Thus a new CAP_{FC} value for the smart battery's **actual** capacity is learned after each full discharge cycle, as a function of the last fully integrated battery discharge cycle. The smart battery 10 is thus able to self correct CAP_{FC} within one full cycle to readjust its capacity at each EOD, and effectively relearn full battery capacity within a single cycle, even if all prior battery history has been extinguished by virtue of a catastrophic memory failure. The smart battery 10 is therefore able to accurately predict **actual** capacity, and typically is able to correctly predict the remaining run time to empty within a few minutes. The Shelf-Sleep mode and the Normal Sleep mode both maintain all the RAM data values previously programmed or learned by the ASIC. However, due to the nature of the use of the Shelf-Sleep mode,

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upon re-activation, or wake-up, the **actual** state-of-charge of the battery and the data contained in the RAM may not match: this difference is automatically corrected at the next point of full charge or full discharge. After step 3016, the processor determines **if the remaining battery capacity value is less** than the capacity uncertainty value at step 3018. If this is the case, the FULLY_DISCHARGED status bit is set at step 3020. From step 3018 (condition false) or step 3020, the processor moves to step 3022, where the state of charge is compared to the state of charge capacity decreasing hysteresis value. If the state of charge is less than this value, then the FULLY_CHARGED status bit is cleared at step 3024. If the end of charge flag is already set at step 5322, the program proceeds to step 5330 and **compares the remaining battery capacity value to the nominal full capacity value. If the former value is greater then or equal to the latter value, than the program goes to step 5332.** At this step, **the remaining capacity value** is set equal to the nominal full capacity value, and the error variables are set to 0. The processor then determines at step 5334, if $-ITF$ is greater than 0 (from $CAP_{rem} = CAP_{FC} - \int I_a - t_a - \int I_s - t + \int M_c I_c - t_c$) If $-ITF$ is greater than 0, than at step 5336, a variable ITF is increased by $-ITF$; and then the over-charging alarm and the terminally charged alarms are set at steps 5338 and 5328 respectively, and the routine then ends [see also column 11, lines 58-61; column 14, lines 55-65; column 15, lines 44-58; column 39, lines 52-67; column 52, lines 64-67; column 53, lines 1-5; column 78, lines 50-62].

With respect to the method claim 6: the method steps will be met during the normal operation of the apparatus described above.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the

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examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Response to Arguments

6. Applicant's arguments filed on August 29, 2003 have been fully considered but they are not persuasive in view of the rejections described above.

7. With regard to applicant's comments that "Although Friel al. provides calculates the remaining capacity of the battery and is the used with other variables, such as temperature, to control the charging of the battery, Friel et al. does not store the calculated remaining stored remaining capacity and does not update the stored remaining capacity": Friel clearly states "The smart battery of the present invention utilizes a hybrid integrated chip (IC) containing an embedded microprocessor and a novel analog to digital connector which receives analog signals from the battery and converts them to digital signals representative of battery voltage, current and temperature. The smart battery microprocessor then calculates actual charge parameters over time from these digital signals according to a predetermined algorithm in which **CAP_{rem} is the remaining capacity of the battery, which is continuously assigned a new value to reflect adjustments for effective charge, discharge, and self discharge** [see column 14, lines 55-65]. "Continuously assigning a new value" inherently means calculating and storing a new value. Additionally, Friel describes using a "Smart Battery". The "**Smart Battery Data Specification**", provided herein for applicant's information, clearly describes a CAPACITY_MODE allowing power management systems to best match their electrical characteristics with those reported by the battery [see page 19], as well as defines the "Smart Battery" as "**a battery equipped with specialized hardware that provides present state, calculated and predicted information to its SMBus host under software control**" [see page 2].

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art cited in PTO-892 and not mentioned above disclose related apparatus: **Shyr et al.** [5903764] discloses a new system has been specified for use in battery powered portable devices that is identified as the System Management Bus ("SMBus"). The SMBus prescribes data protocols, device addresses, and additional electrical requirements necessary to transport commands and information among various subsystems of a battery-powered device. The SMBus specification envisions the SMBus interconnecting at least a system host computer, a smart battery charger, and a smart battery that are all included in the portable device. Under the SMBus protocol, the smart battery provides data, via the SMBus, to the portable device's host computer. A power management routine executed by the host computer processes such smart battery data to manage operation of at least the smart battery and the smart battery charger. "Embedded Systems"-"How to Talk Smart"-<http://www.embedded.com/97/feat9611.htm> discloses a standardized battery/power system interface, and describes the host/battery interface specification.

Arai et al. [5698983], **Uskali et al.** [5455499], **Kawahara et al.** [5739674], **Shimoyama** [5793211], **Marritt et al.** [5847566] all disclose a method and/or apparatus for measuring a remaining battery capacity. **JP-11223665** discloses in the abstract the charging and discharging current of battery (14) is integrated and remaining capacity of the battery is calculated; based on the opening terminal voltage of battery, remaining capacity of the battery is estimated; based on the difference between the calculated value and estimated value, **remaining capacity of battery is adjusted by an updating unit.** **JP-**

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08278355 discloses in the abstract a release voltage detected by a voltage sensor 9 is read by means of a detection value input circuit 12 just after ignition ON, and the preset initial remaining capacity is set in a remaining capacity calculation part 23, then it is indicated by percentage. After a vehicle starts running, a computer 19 samples at 1ms the voltage and discharge, current detected by a sensor 9 and current sensor 7 so as to obtain an approximate line, and the reference discharge current is obtained at percentage as it is set to zero. The data shown by percentage is compared with the previous one, and when it is the same it is indicated as it is, while it is subtracted/added by 1% when it is more than/less than the previous one, then the result is indicated by an indication part 11.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Pia Tibbits whose telephone number is (571) 272-2086. If unavailable, contact the Supervisory Patent Examiner Mike Sherry whose telephone number is (571) 272-2084.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PFT

April 5, 2005

Pia Tibbits

Primary Patent Examiner

